Although the invention has been described and illustrated with a certain degree of particularity, it is understood that the present disclosure of embodiments has been made by way of example only and that numerous changes in the arrangement and combination of parts as well as steps may be resorted to by those skilled in the art without departing from the invention as claimed. For example, the modulator, antennas and demodulator portions of the preferred embodiment communication system as described were directed to CDMA spread-spectrum signals transmitted over a radio communication channel. However, as will be understood by those skilled in the art, the encoding and decoding techniques described and claimed herein can also be adapted for use in other types of transmission systems like those based on time division multiple access (TDMA) and frequency division multiple access (FDMA). In addition the communication channel could alternatively be an electronic data bus, wireline, optical fiber link, satellite link, or any other type of communication channel. Thus, it will be apparent to one skilled in the art that while the invention has been described in conjunction with specific embodiments thereof, it is evident that many alterations, modifications, and variations are possible in light of the foregoing description. Accordingly, the invention is intended to embrace all such alterations, modifications, and variations within the spirit and scope of the appended claims.

We claim:

1. A method of estimating transmission rate in a receiver including a sampler for digitizing a received spread spectrum signal including transmitted data, and a despreader following the sampler for despreading the received spread spectrum signal into a data signal, the method comprising the steps of:

(a) extracting reference sample information from the data signal;

(b) estimating by a rate estimator which slots of a first frame are occupied by the reference sample information; and

(c) outputting a rate estimate based on the step of estimating.

2. The method of claim **1**, wherein the reference sample information is plural reference samples, further comprising storing all reference samples of the first frame in a buffer of the rate estimator and outputting the stored reference samples on a slot by slot basis, and determining which slots are occupied.

3. The method of claim **2**, wherein the step of determining which slots are occupied comprises determining which slots are occupied by a scaled sum of the partial inner product for each slot of all reference samples of said each slot correlated against each of a group of predetermined sequences.

4. The method of claim **1**, further comprising:

(c) determining a channel estimate by correlating the reference sample information with a known sequence determined by the rate estimate, and outputting a channel estimate.

5. The method of claim **1**, further comprising:

(c) determining a channel estimate by filtering the reference sample information with a predetermined one of plural filters based on the rate estimate, and outputting a channel estimate.

6. The method of claim **1**, further comprising:

(c) frequency offset adjusting one of a group consisting of the phase and frequency of the received spread spectrum signal based on the rate estimate.

7. The method of claim **1**, further comprising:

(c) adjusting the timing of the received spread spectrum signal based on both the rate estimate and at least one of the data signal and the reference sample information.

8. The method of claim **1**, wherein the reference sample information includes a sequence selected from a reference sequence family defining an information message, and step (b) further comprises determining the sequence from the reference sample information.

9. The method of claim **8**, wherein the information message is an indication of frame error rate observed at a transmitting unit from which the received spread spectrum signal was transmitted.

10. A coherent spread spectrum receiver, including a sampler for digitizing a received spread spectrum signal including transmitted data, and a despreader following the sampler for despreading the received spread spectrum signal into a data signal, the apparatus comprising:

(a) extracting means coupled to the despreader for extracting reference sample information from the data signal;

(b) rate estimator means coupled to the extracting means for estimating which slots of a first frame are occupied by the reference sample information; and

(c) outputting means for outputting a rate estimate based on the estimating which slots of the first frame are occupied by the reference sample information.

11. The receiver of claim **10**, wherein the reference sample information is plural reference samples and the rate estimator means comprises a buffer for storing all reference samples of the first frame and outputting the stored reference samples on a slot by slot basis, and a rate determining means for determining which slots are occupied.

12. The receiver of claim **11**, wherein the rate determining means is further operable for determining which slots are occupied by a scaled sum of the partial inner product for said each slot of all reference samples of the slot correlated against each of a group of predetermined sequences.

13. The receiver of claim **10**, further comprising:

(c) channel estimator means coupled to the extracting means and rate estimator means for determining a channel estimate by correlating the reference sample information with a known sequence determined by the rate estimate, and outputting a channel estimate.

14. The receiver of claim **10**, further comprising:

(c) channel estimator means coupled to the extracting means and rate estimator means for determining a channel estimate, the channel estimator means comprising plural filter means for filtering the reference sample information with a predetermined one of the plural filters based on the rate estimate, and outputting a channel estimate.

15. The receiver of claim **10**, further comprising:

(c) frequency offset means coupled to the extracting means and rate estimator means for adjusting one of the group consisting of the phase and frequency of the received spread spectrum signal based on the rate estimate.